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COLLEGE OF EDUCATION

TEACHING DEVICES ON THE
HIGH-SCHOOL LEVEL

By

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PREFACE

Successful teaching involves the skillful use of techniques that are compatible with sound pedagogical principles, and probably the most difficult phase of the teacher's planning of instruction is the invention and selection of appropriate devices. The Bureau of Educational Research presents this collection of teaching devices, secured from a graduate thesis, in the hope that it will be useful to teachers on the high-school level. The devices herein presented have been used with apparent success, and in many cases the teacher may appropriate some or even all of the devices given for a particular subject. The greatest value of the collection, however, will be in the suggestions that it will arouse in the minds of the teachers who are interested in increasing the efficiency of their instruction.

WALTER S. MONROE,
Director

March 30, 1931



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TEACHING DEVICES ON THE HIGH- SCHOOL LEVEL

PART I

INTRODUCTION

Purpose of this project. The purpose of this study was to collect, classify, and evaluate original specific teaching procedures being used by high-school instructors. It was thought that a collection of such material would be useful to the average teacher. One of the primary qualifications for a good teacher is a rich stock of special devices—tricks of the trade, so to speak. Nevertheless, the supply of unusual procedures that the average high-school staff member has at his disposal is very meagre. This is especially true of beginning teachers. The need for vitalizing school work has been receiving such widespread attention that doubtless there are in existence a large number of clever devices that are never known outside the school in which they were originated. Many of these would be of great value to other teachers. It was with the hope that some of the best productions of enthusiastic high-school instructors could be made available to teachers in general that this collection of devices was undertaken.

Definition of terms. In the discussion of this project the term "special device" is used to designate those rather unusual specific teaching procedures that display some ingenuity and originality on the part of their authors. In this bulletin the word "device" is interpreted to mean "special device."

Collection of material. The devices collected were limited to six groups of high-school subjects: mathematics, physical sciences, natural sciences, social sciences, English, and foreign languages. Contributions were requested from teachers in Illinois high schools only.

The first step in compiling the collection was to get in touch with teachers who could and would contribute. It was found that there were 426 four-year high schools having faculties of six or more teachers listed in the *Illinois School Directory*.^{*} It was thought that checking every third school in the alphabetical list of the directory would give a representative sampling of the schools of the state. A letter was sent to the principal of each school checked, asking him to submit the names of teachers in his school who were employing unusual

^{*}Blair, F. G. *Illinois School Directory*. Danville, Illinois: Illinois Printing Company, 1928. 171 p.

types of lesson plans, assignment units, problems, motivation procedures, projects, and the like, in the departments of mathematics, physical sciences, natural sciences, social sciences, English, and foreign languages. The fifty-three principals who replied provided the names of 210 teachers.

Since not more than one-third of the field was covered in this survey, it was deemed advisable to bring the problem before the various sections of the Illinois High School Conference in Urbana, November 22, 1929. Accordingly, teachers from the University High School distributed copies of the following announcement to the sectional groups representing the school subjects included in the study:

A Coöperative Project

A project which has for its aim the collection and publication of unusual teaching devices designed by teachers in Illinois high schools is being carried on under the direction of Walter S. Monroe, Director of the Bureau of Educational Research, University of Illinois. He desires to get in touch with all teachers of mathematics, history, English, languages, biological sciences, and physical sciences who have used or are using unique lesson plans, assignment units, problems, motivation procedures, projects, drill schemes, individual or group remedial devices, and the like, in these subjects.

If you have anything to contribute along this line, please fill in the blanks below and leave this slip with the chairman of your section, or mail to the Bureau of Educational Research.

Name.....Department.....
School.....Address.....

Forty-three of these blanks were filled out and handed in at the time or mailed to the Bureau of Educational Research later. In order that the contributors might have some idea of the type of material wanted, and of the form in which the material should be submitted, letters were addressed to the teachers whose names had been obtained, explaining to them the project and presenting several examples of the kinds of devices desired. Contributions were received from fifty of these teachers.

Besides the devices received through the mail, several were obtained through personal interviews with members of the University High School faculty, and a few, from reports of outstanding seniors doing practice-teaching in the University High School. The writer has also been able to include several original procedures tried out in her own mathematics classes at the University High School.

Classification of material. A total of 174 devices was secured. For the purpose of an analytical study, the details of which are not

reported in this bulletin, these devices were divided into the following groups:

1. Devices to provide perceptual experience
2. Devices for motivation
3. Devices for directing study
4. Devices for drill
5. Devices for review
6. Remedial devices

Many of the devices fell into more than one of these classes. Accordingly, they were classified under each of the several types to which they belonged. The following tables show the distribution according to subjects and according to types.

TABLE I
DISTRIBUTION OF TEACHING DEVICES ACCORDING TO SUBJECTS

	<i>Number</i>
Mathematics.....	40
Physical sciences.....	14
Natural sciences.....	35
Social sciences.....	15
English.....	37
Foreign language.....	33
Total.....	174

TABLE II
DISTRIBUTION OF TEACHING DEVICES ACCORDING TO TYPES*

	<i>Number</i>
Devices for perceptual experience.....	52
Motivation devices.....	68
Devices for study direction.....	64
Devices for drill.....	18
Devices for review.....	10
Remedial devices.....	9
Unclassified.....	2

*It will be noticed from the numbers that almost one-third of the 174 devices are combinations of types.

Selection of material. Space does not permit all the contributions to be included in this bulletin. The necessary elimination of material, however, proved an extremely difficult problem. An objective measurement of the excellence of a device was not feasible. It was, therefore, not possible to make the selection upon any single basis. Some devices were omitted because the excessive length of their descriptions made their reproduction impractical. Some were excluded because they were judged to be practices rather well-known to most teachers. When two or three devices were found to be similar, only one of the group was retained. Other devices were omitted because the materials necessary for their use were likely to be available in only

a limited number of schools. Still others, though excellent, were not included in this bulletin because they represented a type of work that only the exceptionally ingenious teacher with an unusual amount of leisure time can produce. The contributions that were retained are thought to be sufficiently representative of the various types of devices included in the project to offer the widest possible variety of suggestions to a reader.

Practical value of this collection. It is the writer's opinion that the devices compiled in this study represent an unusually worth while collection. The value of the bulletin to other teachers does not, however, lie in the extent to which it furnishes them a prepared stock of special teaching procedures. These devices, no doubt, differ in value, but any evaluation effected by a single writer cannot be accepted as an exclusive basis of recommendation. Far more important is the personal reaction of an individual teacher to the device he is intending to use. This reaction is best when the teacher has incorporated into the plan some feature of his own creation—some bit of originality that stamps the device with his own personality.

The value of this collection, then, rests largely in the rich store of suggestions that it presents to its readers. Most of the replies to the questionnaires sent out in this project indicated that even the best teachers in Illinois feel the need of more special devices. The teachers, however, do not feel that ready-made procedures will serve the purpose. Nevertheless, the more clever ideas a teacher acquires from others, the more fertile is his own mind for devising plans of his own. The contributions described in Part II of this bulletin offer a wealth of suggestions to any teacher seeking ideas by which he may increase his own repertoire of special devices.

PART II*

TEACHING DEVICES ON THE HIGH-SCHOOL LEVEL

Introduction. This part of the report contains seventy-eight of the devices compiled in the study. All of them were submitted by Illinois teachers. Each device, except those provided by the writer, is headed by a number, its title, and the name and school of the teacher from whom it came. Those for which the title only is given were provided by the writer. The contributors designated as "practice seniors" were all students in educational practice at the University High School, Urbana, Illinois.

It was found necessary to revise many of the reports of the devices in order to maintain brevity, simplicity, and some consistency of form; however, the original features and details of the procedures have been carefully preserved.

DEVICES FOR TEACHING MATHEMATICS

Algebra

1. A Graphical Progress Record for the Algebra Bulletin Board (J. M. Cline, Bloomington High School)

In the Bloomington High School an exercise book is used to supplement the text in first-year algebra. Most of the exercises in this book are used for drill purposes during the recitation period. A record of progress in this work is exhibited on the bulletin board of the classroom throughout the first semester. The record consists of an alphabetical list of the members of the class, with a "c" placed opposite a student's name to designate each exercise that he has completed without mistakes. If the student works correctly at the first attempt every exercise of the set assigned, the "c" is recorded in red; if he makes mistakes but corrects them within the time allowed, the record is made in black.

In groups that are not classified according to ability, this advertising of progress would no doubt discourage the student who habitually failed to make a creditable showing; but in groups classified according to ability, it stimulates wholesome rivalry and furnishes an incentive to careful work.

*The writer wishes to express appreciation and gratitude to all those whose coöperation made possible this compilation of material; to those teachers over the state of Illinois who submitted reports of original teaching procedures; to the high-school principals who sent in names of teachers capable of making contributions; to the chairmen of the eight sections of the Illinois High School Conference (held at Urbana, November 21-23, 1929) who allowed announcements of the project to be distributed there; to the members of the University High School staff who distributed those announcements; to the office staff of the Bureau of Educational Research for stenographic work; and especially does the writer wish to express grateful appreciation to Professor Walter S. Monroe for the suggestion of the problem, his kindly counsel and guidance, and his careful direction of the project.

2. Introducing Graphs in Algebra (H. M. Luther, Mt. Pulaski High School)

During the study of graphs, the algebra students were asked to find and bring to class examples of the various graphs found in newspapers and in magazines. The response was favorable, and after a discussion in class as to the types of graphs presented and the meanings derived therefrom, the best examples were placed on the bulletin board for further inspection.

3. A Drill Chart for Positive and Negative Numbers

A device for providing the large number of simple problems desirable for oral drill on the fundamental operations with directed numbers may be easily constructed in the form of a chart. A piece of white canvas tacked to a round stick (on which it may be rolled when not hanging on the wall), a broad-pointed "poster" pen, and some heavy black ink are all the materials necessary. Any such arrangement of numbers as the one suggested below may be used.

	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>
A.....	-4	+9	-8	+10	-5
B.....	+7	-2	+4	- 3	-7
C.....	+1	+6	+3	- 1	+2
D.....	0	+8	-6	+ 5	-9

Each number on the chart may be added to, subtracted from, multiplied by, or divided by any other number there. The example above provides 190 exercises for each operation, not to mention the possible combinations of three or more numbers that may be used for further drill in addition.

4. A Remedial Course of Mathematics for Poorly-Prepared High-School Freshmen (W. A. Snyder, New Trier High School, Winnetka)

Thirty freshman students who had low I.Q.'s and who were reported by their grade schools to be so weak in arithmetic that they were almost sure to fail algebra the first semester were placed in a special class. For the first six weeks they reviewed arithmetic. Next, they took up algebra, covering just the fundamental processes, simple equations, evaluation, and checking. Some work in experimental and intuitive geometry was planned for the rest of the semester.

With this review and introduction as a foundation, the students were much better prepared to undertake the regular course in algebra the next semester.

5. A Relay Race (Vera Benner, Edwardsville High School)

Often when a class becomes tired of doing the usual things in freshman algebra, the teacher may permit her students to have a relay race. The class is divided into two groups—one sitting on each side of the room.

A name is assigned to each group. If the relay occurs just before a big athletic contest, one side may adopt the name of the school, while the other side, that of the opponents.

After the first student of each group has been given chalk, he goes to the board and puts on the first line of the problem which the teacher dictates. When this has been done, he carries the chalk to the one who sits back of him. This one passes to the board, corrects any mistakes he sees in the preceding work, and puts on the next line. Thus it goes until the problem is finished. The idea is to see which side will have the problem worked correctly first. The one who is supposed to finish it must do so, as each side is allowed the same number of students for a problem. The score is kept at another board, and at the end of the period a check-up is made to see which side has won.

The "relay race" keeps the boys and girls alert for mistakes, because, naturally, they are anxious for their side to win. Then, too, this device relieves the monotony of the ordinary classroom.

Geometry

6. A Notebook Project for Pre-Demonstrative Geometry Days (E. S. Parrish, Wapella Community High School)

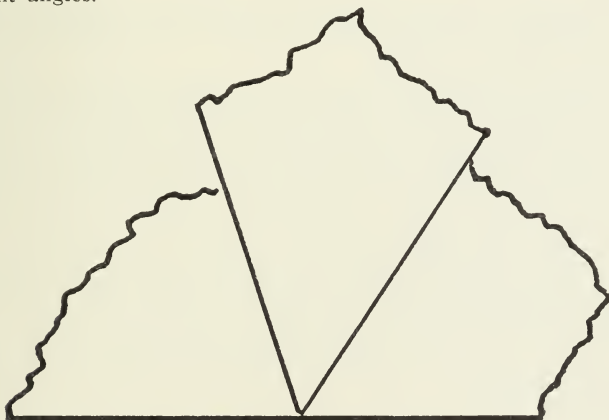
In order that the way may be paved for demonstrative geometry, two or three weeks, either the last of the algebra year or the first of the geometry year, may be devoted to a geometry project. Exercises are used to introduce the student to the use of the ruler, compass, and protractor. In each exercise the student draws his own conclusion. Below is a typical exercise taken from a notebook of a sophomore girl.

Exercise 59

Required: To find the sum of the angles of a triangle.

Material: Any triangle cut from construction paper, and paste.

Procedure: Tear the triangle into three parts so that each part contains one of the angles of the triangle. Paste the angles about a point so as to form adjacent angles.



Conclusion: The angles when pasted about a point form a straight line. In Exercise 17 I found that a straight line forms an angle of 180° ; therefore, I conclude that the sum of the angles of a triangle is 180° .

7. Demonstrating the Insufficiency of Inductive Proof (Walter Hodge, Practice Senior)

Several members of a plane geometry class when called upon to prove a theorem persisted in trying to establish the proof by giving two or three specific illustrations of the desired conclusion. Finally the teacher placed the expression, $n^2 + n + 41$, on the board and asked the class whether or not it represented a prime number for any value of n . Eight or nine values were tried, the result being prime in each case. By that time most of the class were ready to draw a general conclusion. Then the teacher substituted 40 for n and obtained 1681, which is the square of 41.

That ended the argument, for the students agreed that if thirty-nine examples ($n = 0, 1, \dots, 39$) would fail to prove that $n^2 + n + 41$ was prime, it must be very dangerous for them to try to establish theorems by illustration.

8. The Pantograph in Plane Geometry (Marie Weldin, Deerfield-Shields High School, Highland Park)

In a class of excellent students the theory of the pantograph was studied. The class then used the instrument to enlarge maps for their history work and to make silhouettes of a desired size from shadows on the wall. This increased the interest of the class in similar figures and gave to the students some knowledge of projection.

9. Modern Advertisements as Examples of Plane Geometry Definitions (H. M. Luther, Mt. Pulaski High School)

After the students of a class in beginning geometry had learned the first main group of definitions, they were asked to take an advertisement from a current magazine, paste it on a piece of drawing paper, and then number the parts of the drawing that represented the definitions learned.

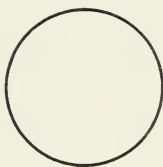
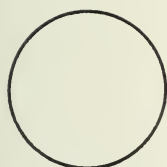
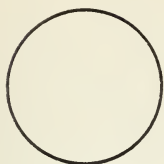
This helped the students to notice the use of geometric forms in structures of various kinds and to understand the importance of geometry in everyday life.

10. An Argument for Rigorous Proof (S. H. Taylor, University High School, Urbana)

A discussion of optical illusions is very effective in the plane geometry class, if it is introduced just after the class has first studied the nature and purpose of the formal demonstration. It is difficult for high-school students to grasp immediately the importance of, or the need for, a formal proof of many of the theorems. They say, "Why, any one can see that this is true." or, "That is obvious; it looks true."

At this stage the teacher may well introduce a considerable number of optical illusions. Many geometry texts and elementary-psychology texts contain simple drawings of the line-segment type of illusion, such as equal line segments with arrow heads pointing in different directions, or systems of parallel lines which look non-parallel because of short segments crossing them at different angles.

The circle drawings present a more novel type of illusion. The students are asked to compare the distance from the left side of the lower left circle to the right side of the lower right one with the inside distance



between either lower one and the upper one. The horizontal or first named distance seems shorter, but it is in reality about a radius length greater. To place letters on the segments named completely destroys the illusion. The other sketch, the circle clusters, have equal inner circles, the one surrounded by smaller circles, and the other, by larger circles. This arrangement seems to change the size of the inner circle.

11. The Significance of the Centroid (Roy Hartman, Practice Senior)

A geometry teacher, just after assigning the proposition about the concurrency of the medians of a triangle, added this list of directions:

"After you have studied the theorem, cut out a triangle of stiff cardboard, construct the medians, put a knot in one end of a heavy string, and slip the other end through the intersection of the medians in your triangle. Bring these figures to class with you."

The next day, after discussion of the proposition, the teacher remarked that the point determined—the centroid—was the center of gravity of the triangles. He then had the students suspend their models by the strings. The students were delighted to find that their triangles, though hanging by only one string, assumed a horizontal position.

12. Geometric Terms in Literature (H. C. Wright, Deerfield-Shields High School, Highland Park)

Among the new books in the school library is Anne Bosworth Greene's *The Lone Winter*, a volume of essays in the form of a journal. From page

144 this excerpt was read to the class: "My neighbors—who did my haying 'on shares'—have taken away their half, cutting perpendicularly down and leaving a shaven precipice in the very middle so that the built-in ladder which bisects the mow barely connects with one small and shaky corner of the square." The reader had asked the class to listen for, and to make note of, geometrical terms. After this little experiment it was suggested that the class be on the lookout for geometrical and other mathematical terms in their general reading. In a few days a student who had heard the passage read brought in a number of sentences which she had found in her reading for another subject.

13. Conducting a Class in Geometry (Edgar Leach, Evanston High School)

By way of background, it should be said that at Evanston the periods are forty-one minutes in length. Students are assigned home work, which almost invariably includes some material to be written and handed in.

The class period in plane geometry is divided roughly into four parts. As the students enter the classroom during the four-minute interval for passing, they leave on the teacher's desk a report of their home-work accomplishment. This report is made on a slip 2 inches by 3 inches. Since this report plays an important rôle in the recitation, the following explanation is in order:

At the top of this slip the student writes his name. Down the left-hand margin he writes the numbers 1, 2, 3, and so forth, corresponding to the number of items in the lesson; e.g., 1. Art. 118, 2. Art. 119 H. I., 3. Ex. 144 H. I., 4. Ex. 145 H. I., 5. Ex. 146 H. I. ("H. I." is an abbreviation for "hand in.") If the student thinks he has mastered Item 1, he puts a star or an asterisk opposite it. If he has tried 2, but not successfully, he puts a plus sign opposite it. If he has done 3 and 4 and has them ready to hand in, he stars them. If he has not tried Item 5, he puts a minus sign opposite it. At the bottom of the slip the student records the number of quarter hours that he has spent on his home work.

These reports are put on the teacher's desk as the class is assembling and are arranged on the desk at that time. After the tardy bell, the assignment is given for the next day. The students are supposed to put this assignment in a small notebook. Often the teacher assigns an extra-credit item. No one has to do it, but the students understand that it is a way of testing power. The better students accept it as a challenge to their ability. Credit is given to those who hand in this extra assignment correctly done. When the item has been corrected, it is returned to the student. Seldom is the extra-credit item discussed in class.

Ordinarily some or all of the home work is put on the board. Glancing over the reports, the teacher directs to the board students who have reported little or no difficulty with the lesson. She seldom assigns to a student an item which he has not starred. Often such an item is not assigned as a board project, but it is discussed with the class later. In general, it does not seem advisable to direct a student to put home work on the board if he has failed to get it during his study period. It is much more economical and effective for him to be listening, or contributing, to a discussion of some point in the day's lesson, in review, or in the next day's assignment.

Now comes the second part of the recitation. While the students to whom board projects have been assigned are performing their tasks, the others of the class are busy with another project. Sometimes they write either on a review or on an item in the day's lesson. At other times they discuss an item at the board, making whatever contributions they can. At all times the students are asked for comments and questions. Those who have finished their board work are expected to become active in the discussions.

As soon as the board work is done, the third part of the recitation is begun. If there has been an item in the assignment that has caused all students trouble, it is taken up at this time. The board work is then discussed. Usually the students who have put the work on are asked to demonstrate. Sometimes, after erasing reasons, if they have been written, the teacher may pass from student to student in developing the proof. All are asked for questions and comments.

Finally, if there is any time left, the remainder of the period is spent either on review or in looking ahead at the next day's assignment. Often this period is cut short. As the students leave the room, they put the "hand-in" home work on the desk.

There are several advantages in this procedure: It takes care of the superior and average students by keeping them constructively active whether at the board or at the seats; it gives the slower students more opportunity to assimilate the material, to clear up difficulties, and to perform on geometry they know; all students are participating during the full class period; the report aids the student, as well as the teacher, to check on daily progress; the report facilitates board assignments and selection of items for class discussion; the procedure provides opportunity for each student to develop initiative and leadership; it makes some provision for individual differences; it affords opportunity to each student to produce up to his capacity.

14. A Special Device for Teaching Substitution (Frances Hudson, Practice Senior)

Some remedial work was being carried on with a girl in plane geometry who could not understand a few theorems, such as those on inscribed angles. After talking to the student a few minutes, the teacher found that some of the trouble lay in the fact that the student did not know what "substitution" really meant. The girl was asked whether she had ever done any cooking, and whether she had ever made French dressing. She had had some experience in cooking, so the teacher went on with the explanation—"French dressing is made of vinegar and olive oil; so we can write it as such: French dressing = vinegar + olive oil. Now in cooking, lemon juice, of late, has been considered the equivalent of vinegar, and vegetable oils, the equivalent of olive oil. Therefore, lemon juice = vinegar, olive oil = vegetable oils. Thus we could make French dressing of lemon juice and vegetable oils, or French dressing = lemon juice + vegetable oils. We have substituted lemon juice for vinegar and vegetable oils for olive oil." By this time the student had seen the analogy and was able to apply it to geometry.

15. Stereoptican Slides for a Theorem Review (Roy Hartman, Practice Senior)

In order to cover all the pivotal propositions of geometry for a semester review, the instructor assigned one or two theorems to each student. Plain glass slides were distributed with the following directions: "Draw on the glass a neat India-ink figure for each of your propositions. Be prepared to present the proofs orally." At the beginning of the next class hour the slides were collected, numbered, and arranged in the order in which they naturally occurred during the development of the subject. As the slides were thrown on the screen in succession, those responsible stepped forward and presented the proofs required. The class had been instructed to grade each presentation on the following basis: two points for statement of theorem; one point each for "given" and "to prove"; six points for proof. At the end of the hour a class committee was appointed to collect the papers, tabulate the scores on each proposition, and report the results the next day.

DEVICES FOR TEACHING PHYSICAL SCIENCES

Physics

16. A Convenient Method for Converting Centigrade Readings to Fahrenheit, and Vice Versa (W. E. Harnish, University High School, Urbana)

In converting scale readings from the Fahrenheit thermometer to the centigrade, or the reverse, pupils almost always have difficulty in remembering whether to add or subtract 32° , and whether to do it first or last. By the following method they always add first and subtract last; hence, there is less danger of confusion.

An examination of the two scales shows that the only temperature at which both thermometers read the same is 40 degrees below zero. If we have a reading in Fahrenheit degrees and add 40 , we have the number of degrees above the point at which both scales agree; the same thing is true for a centigrade reading.

Now 1.8° Fahrenheit is equal to 1° centigrade. Hence, our rule follows: *Add 40, divide or multiply by 1.8, and subtract 40.* Note that the only difference between changing Fahrenheit degrees to centigrade, and changing centigrade degrees to Fahrenheit, is that in the first case we divide by 1.8, while in the second we multiply by 1.8. One can readily determine which to do by remembering that it takes a larger number to express a certain temperature in Fahrenheit reading than in centigrade. Degrees below zero are considered negative, and all addition and subtraction is algebraic.

Example: Change 100° below zero Fahrenheit to centigrade reading.

Solution:

1. Add 40: $-100 + 40 = -60$
2. Divide by 1.8: $-60 \div 1.8 = -33.3$
3. Subtract 40: $-33.3 - 40 = -73.3^{\circ}$, the required centigrade reading

Check: Convert -73.3 centigrade to Fahrenheit reading.

1. Add 40: $-73.3 + 40 = -33.3$
2. Multiply by 1.8: $-33.3 \times 1.8 = -60.0$
3. Subtract 40: $-60 - 40 = -100^{\circ}$, the required Fahrenheit reading

17. A Color Chart for Work in "Light" (A. B. Robinson, University High School, Urbana)

A class studying light made an attractive and useful color-display chart from a square yard of canvas, some scraps of old window blinds, paper, water colors, and some snap fasteners. Pieces of paper painted the desired tints with carefully mixed water colors were pasted upon discs cut from the window-blind material. Half of a snap fastener was sewed to the back of each disc. The other halves of the fasteners were arranged on the piece of canvas in the form of a circle. The chart was fastened to a stick so that it could be unrolled and hung on the wall at a moment's notice. When the chart was in use, the primary colors were snapped into position in the circle and the intermediate colors properly arranged between them. The display then provided excellent drill in the selection of various color composites.

18. Contests in Physics (Suggestion taken from Preische, W. A. "Contests in Physics—a Reviver of Interest," *School Science and Mathematics*, 29:613-14, June, 1929.)

An elaborate list of questions is gathered from the text, laboratory work, practical applications, projects, references, and class inquiry. These are typewritten on file cards and shuffled. The class is divided into two groups, either by student's choice or by the teacher's selection, with a captain in each group. A score board of baseball pattern is placed on the blackboard, and the scores are recorded as the questions are asked and answered. Three "cuts," wrong answers or failures to answer, on each side constitute an inning. The teacher determines the number of innings for the length of the game and, incidentally, acts as umpire and score keeper. This device is especially conducive to enthusiasm in a group of boys.

19. A Foundation Review of Mathematics for High-School Physics (W. F. Einbecker, Deerfield-Shields High School, Highland Park)

In order to help students apply the principles of mathematics to problems in physics, the instructor prepared a typewritten discussion of the topic, "Some Principles of Mathematics Involved in the Study of Physics." This paper is divided into five parts and is the basis of the first week's work.

Part I deals with mathematical terms and processes. It shows that such expressions as "fractions," "square root," "coefficients," "exponents," and so forth, are but special cases of the fundamental processes known as "addition" and "subtraction," and "multiplication" and "division." Furthermore, every process is shown to have an inverse or neutralizing process.

Part II deals with the solution of mathematical problems and may be summarized as follows: (1) Read the problem to determine the data given and wanted; (2) determine the variables and constants; (3) state in symbolic form the data wanted and given; (4) form the equation (Note: See Part III following); (5) substitute values; (6) solve the equation according to the rule for solving equations in one unknown. (Rule: Perform the inverse mathematical processes from those shown in that side of the equation from which the unknown is to be found, treating both sides of the equation alike).

Part III deals with the development of equations, showing that all equations of physics are examples of the power function, $y = a x^m$, by developing the ideas of direct and inverse proportions as applied to the measurement of the area of circles and squares.

Part IV deals with the form of the graph that shows direct and indirect proportions.

Part V deals with the changing of units of measure from one system to the other. A perfectly mechanical method, involving the above principles of mathematics, is developed.

Chemistry

20. A Device for Creating General Interest in Chemistry (J. F. Pinkerton, Rushville High School)

Two sections of chemistry meet together on Fridays to hear reports by members of the class on topics of chemical interest or to view a moving picture projected from an industrial film relating to the subject under consideration.

Experiments suggested in chemistry periodicals sometimes form a part of the program. They awaken interest and can be referred to when the principle involved is taken up in the course.

Credit is given for reports on current topics relating to chemistry.

The attempt has been made to create an interest in chemistry among the entire student body by putting on a chemical play or demonstrations of chemical phenomena during general-exercise periods.

21. A Daily Quiz Plan in Chemistry (B. H. Ball, Deerfield-Shields High School, Highland Park)

Every day in the chemistry class the teacher administers a short written quiz limited to five minutes or less and based on the advance assignment, laboratory work, review, problems, and so forth. Each question is graded and so marked that a student knows definitely whether his response was correct or not. Graded papers are then returned the next day and reviewed in class. These daily quizzes seem to accomplish the following benefits: Students prepare more consistently, review more consistently, learn to analyze assignments for important facts, settle down to work quickly on coming into the classroom, usually review the assignment just before class to freshen their minds, and gradually lose the fear of more formal examinations. The quizzes also serve as means of definitely evaluating students' accomplishments and the instructor's own teaching efforts. Often this last benefit is the most important of all.

22. A Remedial Project in Analysis (Adapted from Franklin, G. T. "A Simple Practical Problem in Analysis," *School Science and Mathematics*, 29:414-18, April, 1929.)

A test given after a teacher of chemistry had presented an illustrated lecture on the analysis of baking powder showed that the class had failed to comprehend the meaning of either the lecture or its illustration. Each student was told to bring a sample of some kind of baking powder to class the next day. Then under the teacher's direction each performed certain

tests upon his sample, which resulted in showing the presence of certain ingredients. In the meantime the teacher devised an experimental instruction sheet outlining tests for carbonate, phosphate, calcium, tartrate, sulphate, and starch. With these instruction sheets and new samples the members of the class were set to work alone the next day. By the time the project was finished they could, by experiment, list the ingredients and their amounts for any kind of baking powder.

23. Flash Cards for Chemistry Class Drill (S. A. McEvoy, Rockford High School)

Flash cards containing chemical compounds and formulas have been found to be very successful. The cards are held before the class for a second and then withdrawn. The students are then required to write the formulas or compounds. This process seems to train them in quick thinking.

General Science

24. An Introduction to the Problems of Obtaining a Good Water Supply (J. R. Byerley, University High School, Urbana)

This plan was devised to direct a class in general science in their study of water supply. The assignment was developed during a one-hour period by first drawing upon the general knowledge of the students. The teacher wrote suggestions about water supplies on the board as they were contributed by the students. These items of information were analyzed in class discussion until, by suggestion, questions, and answers, the following outline was organized:

- | | |
|--|--|
| <p>I. Requirements</p> <ol style="list-style-type: none"> 1. Pure 2. Soft 3. Cheap 4. Abundant supply 5. Efficient distribution | <p>IV. Methods of controlling</p> <ol style="list-style-type: none"> 1. Faucet 2. Flush tanks 3. Good plumbing 4. Hot-water system |
| <p>II. Sources</p> <ol style="list-style-type: none"> 1. Wells <ol style="list-style-type: none"> a. Deep b. Shallow c. Artesian 2. Springs 3. Rivers 4. Lakes | <p>V. Prevention of pollution</p> <ol style="list-style-type: none"> 1. Cess pool 2. Treating sewage 3. Testing 4. Sewers 5. Septic tanks |
| <p>III. Distribution</p> <ol style="list-style-type: none"> 1. Lift pumps 2. Force pumps 3. Reservoirs <ol style="list-style-type: none"> a. Standpipes b. Water mains | <p>VI. Purification</p> <ol style="list-style-type: none"> 1. Boiling 2. Storage 3. Distilling 4. Chemical treatment 5. Filtering |

The class then turned through the textbook chapter on water supply, noting where information about each item in the outline could be found. The teacher added a list of directions to guide them in finding library references on the subject. The final assignment for the next day, a two-hour laboratory period, followed. Every student was to be prepared to talk five

minutes on any one of the six major topics in the outline. Directions for organizing short talks had been given the week before. The class was to have the right to question each person on the floor as soon as he had finished his talk. The results of the plan in this class were very gratifying. No one failed to respond. One boy illustrated his talk with an elaborate board diagram of the local water works. The best of the talks was used as a feature of an assembly program a few days later.

DEVICES FOR TEACHING NATURAL SCIENCE

25. **An Artificial Ant Nest for Insect Study** (Adapted from Miller, D. F. "An Artificial Ant Nest as a Project in the Teaching of Biology," *School Science and Mathematics*, 29:256-59, March, 1929.)

This device provides the biology laboratory with material for first-hand study during the winter months. The students who are handy with tools can construct the case out of wall board and window glass. No certain design need be followed. Only three features are necessary.

1. It must close tightly at first to prevent the ants from escaping before they become at home in their new quarters.

2. One side or corner of the nest must be moist. Arrangements for inserting a sponge may be made.

3. Part of the cover must be of glass to facilitate observation.

A small ant colony to populate the nest may be dug up quickly and placed in a quart fruit jar. If the jar is chilled, the contents—ants, eggs, young, and all—may be dumped into the new nest intact. It may then be darkened or covered to make the ants settle down quickly.

The ants require little care. Small bits of food and drops of water may be introduced in one corner or compartment. The kind of food depends upon the kind of ants and may be determined by experiment. Sugar, honey, insects freshly killed, raw or cooked meat, and the pulverized yolk of a hard-boiled egg are some of the things that may be tried. The feeding chamber or corner may need cleaning, but the ants will clean the part of the nest in which the eggs and young are kept, if the lid is removed for a few minutes.

Activities of the insects may be observed through the cover with the aid of a hand glass. All feeding activities, egg-laying of the queen, care and sorting of the eggs, and treatment of the young are some of the things that can be studied. Group protection may be demonstrated by the battle that ensues when a few new ants are introduced into the colony. In fact, the possibilities of interesting and profitable study are almost unlimited.

26. **A Remedial Project for a Skeptical Student** (Suggestion taken from Coopriider, J. L. "Individual and Class Projects in Biology," *School Science and Mathematics*, 29:267-72, March, 1929.)

A girl in a biology class did not believe the teacher's statement that the body of a grasshopper had many parts analogous to the human body. The teacher suggested that she dissect a grasshopper and see for herself. The

challenge was accepted. After tearing up a few grasshoppers rather haphazardly, the girl realized that she must learn more about the insect itself before she could prove or disprove the teacher's statement. Careful reading and a detailed study of the required material naturally followed. The student was then able to make a precise dissection, compare the results with an anatomical diagram, and see the truth of the original statement.

27. **Star Maps** (O. D. Frank, School of Education, University of Chicago)

Materials: The pupils are asked to bring to the classroom on a certain day a syrup pail, tomato can, or can of similar size. On the appointed day the teacher has on her desk the following articles: star maps, which may be cut out of nature magazines; three or four small hammers; carbon paper; and nails of three sizes.

Directions: Make on plain white paper carbon copies of the star maps. Place a carbon star map on the bottom of the pail or can. With a large nail make holes through the paper and bottom of the pail or can. These represent the largest stars on the map. In a similar manner drive smaller nails through the paper and tin to represent the smaller stars.

On a clear night take your pail or can, and by means of a flash light or candle placed beneath the star map you can see the starry heavens shining through the bottom of the can or bucket. Locate a given star on your map. Now find the same star in the sky. This device always creates enthusiastic interest among boys and girls.

28. **Animal Tracks** (O. D. Frank, School of Education, University of Chicago)

Directions: Obtain small, fairly strong pasteboard boxes, or cigar boxes, or small boxes which can be made in the manual training shop. Place modeling clay or common red or yellow clay in the bottom of the boxes. The surface of the clay should be very smooth. Permit an animal to walk on the clay, or take its foot and make an imprint on the clay.

Tracks of mice, rats, cats, dogs, pigs, sheep, goats, calves, ponies, guinea pigs, turkeys, chickens, ducks, geese, frogs, toads, turtles, alligators, as well as tracks of baby brother or sister, can be recorded in the clay.

This little stunt provides a very merry way of becoming acquainted with the tracks of different animals.

29. **The "Gimme" Bag** (O. D. Frank, School of Education, University of Chicago)

Before going on a field trip prepare as many cards 1 inch by 2 inches in size for each student as the number of specimens you expect the class to identify. Place the student's number in a circle on the upper left-hand corner of each card. On the upper right-hand corner of the card place the number of the specimen. A rubber band should be placed around each set of cards. Give each student his set of cards.

When the first specimen is pointed out, each student writes its name on his card numbered "1" and drops it in the "Gimme" bag. When all students have dropped the first card in the bag, the teacher names the speci-

men. In a similar manner specimens are named and identified until the cards are all in the bag. The cards are then assorted and scored.

30. **Insect Life Histories** (O. D. Frank, School of Education, University of Chicago)

Directions: Collect the eggs, larvae in various stages of development, and adult insects. Mount them in glass tubing as follows: Seal one end of the tube with sealing wax or by heating the end of the tube. Place the eggs in the bottom of the tube and pour in a 5 per cent solution of alcohol or formaldehyde. With a smaller glass tube or stick push a piece of cork or corn pith down into the tube near the eggs. Now place in the tube the smallest larva you can find. Over the larva put a second piece of cork. Continue until you have a complete life history. Seal the upper end of the tube with sealing wax. Small numbers should be pasted opposite each specimen in the tube. Descriptive data should be written on a card.

When several life histories have been prepared, it is well to build a stand to hold them. For the stand you will need two pieces of soft wood 14 inches long. One of these pieces of wood should be 1 inch wide and $\frac{1}{2}$ inch thick, and the other should be 4 inches wide and 1 inch thick. Bore fourteen holes 1 inch apart in the $14 \times 1 \times \frac{1}{2}$ board. These holes should be a little larger than the diameter of the glass tubing. In the second piece of wood countersink fourteen holes $\frac{1}{2}$ inch in depth 1 inch apart. You now have the top and base of your stand. Prepare two pieces of wood 1 inch square and about 1 inch shorter than the length of tubes in which you have placed your insect life histories. These are the uprights for the stand. Sandpaper the four pieces of wood and fasten them together with nails or screws. When painted this is a very attractive device for displaying insect life histories.

31. **"Indian Runners"** (O. D. Frank, School of Education, University of Chicago)

Take your class to the field or to a museum. Find a comfortable seat. Tell the students that they are "Indian Runners." Send each one away to find the answer to a given question. When he has found the answer, he returns to the teacher and gives his report. If his report is correct, he is given one point. If he fails, he must make additional attempts until he succeeds in bringing the correct answer. The student who secures the greatest number of points wins the game.

The game may be varied by dividing the class into two teams. The team having the greatest number of points at the end of the hour wins.

The following will serve to illustrate the type of questions asked:

Are the leaves of the elm tree opposite or alternate?

Which shoulder of an elm leaf is the higher?

Are the low shoulders of elm leaves away from the branch or toward the branch?

Describe the notches on the edge of an elm leaf.

Describe the ribs on an elm leaf.

Do all elm leaves have the same number of ribs?

Are elm leaves smooth or rough?

What is the shape of an elm tree?

Where are the buds on an elm tree?

- Describe the fissures in the bark of an elm tree.
 Can a grasshopper be drowned by holding his head under water? Explain.
 How many eyes has a grasshopper?
 Where are the ears of a grasshopper located?
 Are the antennae of a grasshopper below or above his eyes?
 Find three ways in which a grasshopper is fitted to live in the grass.
 How far can a grasshopper hop?
 Do all of a grasshopper's legs have spines on them?
 Discover why a grasshopper spits "tobacco juice."
 On what part of a grasshopper's body are his wings fastened?
 On what part of a grasshopper's body are his legs fastened?

32. A Seed Study (O. D. Frank, School of Education, University of Chicago)

At the beginning of school suggest to your class that making a seed collection affords an interesting way to become acquainted with plants. The easiest and most scientific way of identifying plants is through a study of their seeds. The roots, stems, bark, leaves, buds, and other parts of plants may be very similar to those of a plant belonging to another family, but the seeds are usually distinctive.

If each member of the class will save the seeds of the fruits and vegetables eaten, will secure any other seeds that he can, and will bring them to class where they may be placed in properly labeled containers, a most interesting and varied collection can soon be made.

The following list will suggest some of the kinds of seeds that may be secured:

<i>Fruit seeds</i>	<i>Grains</i>	<i>Melon</i>	<i>Legumes</i>
apple	wheat	water-melon	beans
pear	corn	citron	peas
cherry	rye	cantaloupe	locust
plum	oats	cucumber	cloves
prune	barley	squash	peanut
grape		pumpkin	
orange		gourd	
lemon			
rose			
almond			
peach			
<i>Vegetables</i>	<i>Nuts</i>	<i>Flowers</i>	<i>Shade Trees</i>
cabbage	pecan	four-o'clock	maple
radish	hickory nut	morning glory	box elder
turnip	chestnut	sun flower	ash
beet	hazel nut		elm
red pepper	walnut		catalpa

Each student should provide himself with a board about 1 foot square. The end of an apple box or an orange crate is ideal. The board should be made smooth on one side, and just before the seed study is to be made a thin layer of plasticine should be spread over this smooth surface. When all of the boards are ready, each member of the class is given a bag containing five of each kind of seed with the instructions to arrange the seeds on the board in the most scientific and interesting manner possible.

Walk among your students and note how each attacks the problem. This device affords a most interesting psychological study.

33. **Earthworm Castings** (O. D. Frank, School of Education, University of Chicago)

Directions: Locate a plot of ground fairly well covered with earthworm castings. Carefully gather the castings from a square foot of ground. Dry the castings thoroughly and weigh them accurately. Estimate the number of tons of soil per acre brought to the surface by these "living plows."

34. **Leaf Life Histories** (O. D. Frank, School of Education, University of Chicago)

Directions: Select five common trees growing in your neighborhood; take a bud from each of these trees before the buds begin to open in the spring. Mount the buds on a large cardboard, placing them in a perpendicular row about 6 inches apart at the left of the cardboard.

When the buds open, obtain a tiny leaf from each tree and press carefully. Mount each leaf to the right of the appropriate bud on your cardboard. Continue this procedure once each week until the leaves are fully developed. Record under the leaf as you mount it on the cardboard the date on which it was obtained.

When your collection is complete, summarize in tabular form the facts you have learned concerning the growth of leaves. You will find this to be a most fascinating and interesting study.

35. **Raising Silk Worms** (O. D. Frank, School of Education, University of Chicago)

Directions: When the buds of the mulberry trees begin to open in the spring, send fifty cents to Mr. F. A. Kelcher, P. O. Box 141, Pennsylvania Avenue Station, Washington, D. C., for silk worm eggs. Place the eggs in a box and keep a supply of mulberry leaves near them. The eggs will hatch in a day or two. The larvae need no care except to be supplied with fresh mulberry leaves. The leaves should not have moisture on them, nor should any water be given to the worms. The box need not be covered, for the worms will not leave the leaves. The worms should be supplied with small branches when they are ready to spin their cocoons. When the moths emerge from the cocoons, they may be kept in an open pasteboard box. If the eggs are put in a cool place, they may be kept until the following spring, when they will hatch out upon being brought to a warm place.

It is a most fascinating study to watch the silk worm go through its metamorphosis from egg to adult.

36. **Blue Monday Sermons** (O. D. Frank, School of Education, University of Chicago)

"A good start is half the race." The week may be started in "tune" by a little five-minute talk on Monday morning. The talk may be given by the teacher, or students may be given the privilege of delivering the "Blue Monday Sermon." The only requirement is that the topic must begin with the letter "B." The following have proved to be interesting topics:

Bees	Beans	Beauty
Bears	Buds	Bravery
Bunnies	Blossoms	Bragging
Bats	Branches	Blustering
Boa constrictors	Blue Bells	Brothers
Birds	Berries	Broadcasting
Beetles	Bushes	(gossiping)
Bugs	Bananas	"Buttinskies"
Babies	Banyan tree	Blessings
Butterflies	Bacteria	Being natural

37. National Apple Week (O. D. Frank, School of Education, University of Chicago)

Beginning on Hallowe'en each year, cities, schools and other organizations devote a week in displaying and studying the apple. Suggestions for the celebration project follow:

Suggestions for Celebrating National Apple Week in Schools

1. Early in October science teachers should suggest the celebration to their classes.
2. Collect varieties of apples from orchards, from the local markets, and from the various apple-producing sections of the country.
3. Secure literature from the U. S. Department of Agriculture and from state bureaus of agriculture and horticulture.
4. Obtain posters, buttons, and other materials from National Apple Week Association, Rochester, New York.
5. Have students prepare slogans, posters, placards, songs, poems, and plays pertaining to apples.
6. Coöperate with the Art and Domestic Science departments.
7. Use glass cases and tables for displaying apples and apple products.
8. Students are always glad to supply jelly, sauce, pies, tarts, apple butter, cider, vinegar, and the many other apple products.
9. Grocers will lend samples of the apple products handled in their stores.
10. Permit each room in the school to have an apple display. Offer a prize of a basket or box of apples for the most original and complete display. The prize may be donated to an orphan home, to a children's ward in a hospital, or to a needy family—a happy way to dispose of the apples and apple products at the close of the celebration.
11. See to it that each teacher and every one connected with the school, including the janitors, is presented with a rosy or golden luscious apple.
12. Send invitations to parents, grandparents, and others to visit the display.

Suggestions for Displaying Apples and Apple Products

1. Secure as many varieties of apples as possible and place one of each variety on a large table. Label each apple carefully.
2. On another table arrange plates of apples (four apples, three below and one at the top) as follows: the largest apples, smallest, sweetest, streakedest, sourest, reddest, yellowest, greenest, best looking, best for cooking, best keeping, best for shipping, juiciest, mellowest, most fragrant, best for cider, best for sauce, best for baking, and so forth.
3. On still another table show variations in apples—i.e., largest to smallest of a given variety, and various colors in a given variety.
4. An "apple hospital" in which diseased apples are displayed adds much to the celebration. Information telling how these diseases are prevented or cured may be placed on this table.
5. The "joker" or "clown" table draws many visitors. On this table a large potato is displayed as the "Irish Pippin"; a large onion, as the "Spanish Wine-sap"; a tomato, as the "love apple"; three small pumpkins, as the "Three Golden

Apples of Hesperides"; garlic, as "Italian crabs." Many other original "apples" may be displayed. Perhaps some ingenious boy can prepare a clay model of "Adam's Apple" for this joyous, joker jumble.

38. Exchanging Collections (O. D. Frank, School of Education, University of Chicago)

Last year a class in a little school at the edge of the Sand Dunes made a collection of the interesting plants which are found growing in that region. Letters were sent to a similar class in a Florida school near the ocean beach, suggesting that "we exchange collections." As a result beautiful shells were sent in exchange for the interesting plant collections.

39. A Classroom Wild-Flower Garden (O. D. Frank, School of Education, University of Chicago)

Living things, either plants or animals, give added interest to the nature-study room. Lack of sufficient sunlight, irregular temperatures of the room during week-ends, and the prevailing dryness of the air make it impossible to grow plants, such as geraniums, begonias, ferns, and other house plants, in the average school room. Dandelions, the most successful of all plants, and burdock, cactus, and other wild hardy plants may be grown successfully in spite of the conditions mentioned above. Simply dig them up late in the fall, place them in generous pots filled with good dirt, keep them watered—very little for the cactus—and you will have an interesting wild-flower "garden" throughout the year.

40. Baked Potato for Bacteria Culture (O. D. Frank, School of Education, University of Chicago)

As the title suggests, a baked potato furnishes an ideal sterile medium for growing bacteria cultures. Bake the potato, let it cool, open and inoculate it, and place it in a sterilized mason jar. (Place the jar, rubber, and lid in boiling water for fifteen minutes before placing the potato in it.)

41. Natural Science Reading Records (O. D. Frank, School of Education, University of Chicago)

Keeping a record of the voluntary supplementary reading of books and magazine articles pertaining to nature study is an excellent method for interesting boys and girls in plant and animal life.

The following is a suggestive outline for keeping the record:

- Author
- Title of book or article
- Publisher
- Number of pages read
- A brief statement of your impression of the book or article read

DEVICES FOR TEACHING SOCIAL SCIENCES

History

42. "Who's Who" Contest (H. M. Price, Robinson Township High School)

A "Who's Who" contest is an excellent device for making characters in

history seem real. Each student in the class is assigned an outstanding historical character. Each looks up as much material as he can find about his character and presents him to the class. The presentation may take the form of a discussion of characteristic actions, appearance, or peculiarities of personage. Or, the character may be impersonated in pantomime. The use of costume accessories often makes the character more vivid to the spectators. The member of the class who identifies the most characters is the winner of the contest.

43. Questions as a Supplement to a Text Assignment (Improved from the report of a practice senior, University High School, Urbana)

A teacher of history, having just directed her class to cover the material on pages 332-42 in their text, supplemented that assignment with the following:

1. Douglas was not so much interested in slavery when he was pushing the Kansas-Nebraska Bill, as he was in something else that your book does not even mention. Find it.

2. The Supreme Court decided something else about Dred Scott that your text does not tell you. Find the real decision.

3. In your estimation, which of these terms, if any, most accurately describes John Brown: fanatic, crazy, or criminal? Why?

Almost the entire class plunged into the lesson with enthusiasm the very next period, and most of them did a commendable piece of library work on the assignment.

44. A Unit Plan for One Year of United States History and Economics (P. W. Slocum, Deerfield-Shields High School, Highland Park)

A series of units is given—one group for the first semester, covering material up to the Civil War, and another for the second semester, placing emphasis on economics and economic history. The course ends with a survey of the United States as a world power.

The units are as follows:

First Semester

1. The coming of Europe to America
2. The breaking away of the colonies from Europe
3. The rise of the common man
4. The extending of our boundaries
5. Slavery and secession

Second Semester

1. Financial history since 1860
2. Big business since 1860
3. Railroads since 1860
4. Labor and labor unions
5. The tariff
6. The United States as a world power

A unit requires from two to four weeks. Mimeographed sheets outlining the work for each unit in detail are distributed to the class. All necessary study material, including the regular texts and the library reference

books, is brought into the classroom at the beginning of the hour. Most of the fifty-five-minute period is used for individual work. Whenever the necessity for discussion arises, the teacher leads it. Short quizzes are given frequently to test the understanding of special assignments, while longer examinations follow each unit. All other classroom work is informal. About seven or eight hundred pages of outside reading are required each semester.

45. Dramatization of the Quakers Leaving England (Improvised from the report of a practice senior, University High School, Urbana, Illinois)

A class in history, studying the situation that led to the Quaker emigration to America, found that they could dramatize the topic without any great inconvenience.

The first assignment was for every one in the class to find out from the text and library references something about the lives and customs of the Quakers, their reasons for leaving England, and the general history of the incident. At the beginning of the following class period it was decided that the drama should be divided into three acts:

ACT I.—The Quakers are discovered in their English homes. From their conversation the fact is conveyed that it is Sunday, and they are sitting at home reading. The English soldiers enter and arrest them for not going to church.

ACT II.—The Quakers hold a meeting, tell of their fines, and decide to go to Holland.

ACT III.—A group of confused Quakers, surrounded by Dutch who are jabbering unintelligibly, are discovered in Holland. The Quakers draw off to one side, confer seriously, and decide to come to America where their mother tongue and customs will be retained.

As soon as this outline was made, the class was divided into three groups to write the lines for the three acts. They set to work at once, the teacher helping each group in turn. By the end of the hour, crude and brief though they were, lines for the drama were completed. The assignment, made during the last three minutes, was for each group to be responsible for getting a copy of the lines of its act ready for every other member of the class at the beginning of the next recitation hour. Group I were to be the Quakers; Group II, the English; and Group III, the Dutch. The dramatization took place in class the next day, the teacher directing, and the characters reading their parts.

46. A Flag Project in History Study (Mary Newlin, Robinson Township High School)

One American history project consists of making seven flags, beginning with the flag used by Columbus and covering other periods in American history. The flags are made of cambric and are about 18 by 24 inches in size.

47. A Costume Project in American History (Mary Newlin, Robinson Township High School)

This project consists of dressing dolls to represent different periods of

history. There are six in this collection, beginning with the Puritan maid and ending with the modern girl. All such material is kept in a display case in the history recitation room.

48. A Trip to Europe (H. M. Price, Robinson Township High School)

For general review in modern European history, during the last week of school an imaginary trip abroad is conducted. So far as possible the student is permitted to choose the country he wishes to visit. The first class hour after the assignments have been made and the trip planned is spent in the library collecting material. The second day the trip is begun with the ocean voyage. The teacher explains the method of obtaining tickets and passports and calls attention to other necessary preparations for the journey. In each country the exchange of money, the customs of the people, and visits to historical buildings and places are considered.

Civics

49. A Mock Trial in Civics

A civics instructor planned a mock trial as a climax to the study of court procedure. A member of the class was reported arrested for a flagrant violation of school rules, and the time was set for the trial. Witnesses were found, attorneys appointed, and the necessary court officers selected. A local lawyer consented to talk to the class on the day preceding the event, describing the necessary formalities of trial procedures and answering any questions that the defendant, lawyers, prosecutor, witnesses, judge, and the jurors cared to ask. The result was a very realistically conducted trial. Every student who was in that class now has an accurate impression of court procedure.

DEVICES FOR TEACHING ENGLISH

Composition

50. A First Written Lesson in Freshman English (Ruby Mann, Minonk High School)

To find out at the very beginning of the first-year English class whether the members could make complete sentences and group them into paragraphs with indentation and margin, as well as to obtain some interesting information, the teacher made the following assignment: "Please bring to class tomorrow a list of the qualities or characteristics you would like a teacher to have if you could choose one entirely to your liking. Use only complete sentences and group the statements relating to each characteristic in a separate paragraph. Leave a margin on the right and indent each paragraph one inch." The students were then asked whether they would like the teacher to make a similar list of the qualities she would like in her students. They were eager for this. The lists were read and discussed, and it was found that the very qualities students wish in a teacher are also qualities desirable in a pupil. The results proved worth while as a means of creating an atmosphere of coöperation and a desire to be fair to the

teacher. The assignment proved to be an interesting one for a first written lesson.

51. Devices to Promote Better Word Choice (M. E. Boyer, Danville High School)

To encourage better word choice in composition work, have the students bring to class lists of color words, sound words, musical words, and striking words. There will be noticeable results in word choice, if the teacher will read poems aloud and ask the students to write down vivid and unusual words or groups of words they hear in the selections.

52. Observation Lists for Description Themes (M. E. Boyer, Danville High School)

To develop ability to describe, have each student make a list of attractive small objects which he sees on the way to school. After that all members of the class may look for a number of pretty things in a designated two blocks. Then have the students compare and discuss their lists in class. Follow this with the assignment of a written description of one of these objects. This will help many to use their eyes much more than they have been in the habit of doing. The other sense organs may be used likewise. This may be continued with reference to observation of people and may act as a stimulus for the germ of a narrative plot.

53. A Corrected Theme Notebook for Reference (Clara Martin, Sidell High School)

One teacher requires each person in her classes to buy a composition book in which to keep the themes that are assigned from time to time. The themes are looked over, mistakes are marked, and the composition books are returned to the students in order that they may make the necessary corrections. If improvement over a preceding theme is shown, the teacher makes a notation to that effect in the composition book. Thus before beginning another theme, the student may glance over preceding ones and profit by his mistakes.

Literature

54. Some Questions that Provoke Good Discussions on English Classics (A. M. Jacoby, University High School, Urbana)

1. Suppose you were the director of this Shakespearean company. What stage directions would you give Hamlet at this point?
2. If you were the stage manager, how would you set the stage for this scene?
3. If the wife of Bath were a modern woman, what would she be like?

55. Posed Photographs of Silas Marner (A. M. Jacoby, University High School, Urbana)

A class in English literature had a great deal of fun while studying *Silas Marner* by taking posed photographs to illustrate the story. On a winter day one of the students huddled against the snow-covered bushes in the school yard in an attempt to portray the character, Molly, dying in a snow bank. During the next few days the class ransacked attics for old-

fashioned costumes and one afternoon appeared on the steps of a neighboring country church as a bridal procession in ancient dress. Later the character Silas was photographed against the effective background of the village blacksmith shop.

56. **A "Raveloe News"** (Lola Brock, Toluca High School)

While the freshmen were studying *Silas Marner*, they were asked to make a newspaper in which they were to present items and stories from the novel. About two weeks before they had finished the classic, each student was given a sheet of paper about 18 inches wide and 24 inches long and asked to make the paper folio form. They were then given suggestions as to the amount of space to allow for advertisements, news items, announcements, and news stories. After they had studied the novel, one day was given for completing their project. The work was enjoyed by the class, and much originality was shown in the cartoons and the advertisements.

57. **Original Anthologies as an Introduction to Poetry** (A. M. Jacoby, University High School, Urbana)

Each student in a junior English class just beginning the study of poetry was asked to make his own anthology of poems that he really liked. The instructor made her own collection first and brought it to class as a suggestion for what the students might do. She advised them as to sources and listed anthologies both old and new, such as Palgrave's *Golden Treasury*, Stevenson's *Home Book of Verse*, Masfield's *Salt Water Ballads*, and Wilkin's *New Voices*. She also brought into the classroom clippings from magazines (the current poetry page in the *Literary Digest* is good; also the *Poetry Magazine*) and some pictures for possible illustrations. The students were not limited to the type, period, quality, or form of the verse. When class and teacher understand each other, such a lack of restraint does not make the students incredulous or the instructor apprehensive.

A date was set, one or two weeks ahead, on which each student was to hand in a preliminary draft of these collections. It was suggested that the poems could be clipped and pasted in their anthologies, or written long-hand, or typed. From ten to twenty poems were expected.

The results were, for the most part, very interesting. The books ranged from neatly typed sheets bound in a manila folder, to large, profusely illustrated scrapbooks with attractive covers. Most of the poems were modern. Kipling's "If" and "An If for Girls" proved very popular. Specimen pages were pasted on the bulletin board, and some of the students asked permission to borrow them long enough to copy the material presented. The idea of continuance was stressed so that the anthologies, when called in again, would show additions. The aim of enjoyment and wider reading of poetry was realized, and in addition, the instructor received some excellent ideas with respect to the reading tastes of these students.

58. **A Project in American Literature** (Lebelva Connelly, Deerfield-Shields High School, Highland Park)

A teacher of American literature suggested to her sophomore class that she thought it would be entertaining, profitable, and, perhaps, surprising to find what poets had thought or felt on different subjects, such as trees, the

sea, the seasons, or to find how poets had expressed thoughts or feelings that the students themselves had experienced. Any interested student was to report his subject to her in order to receive any help that she might be able to give in suggesting authors or books. No grade was offered and no compulsion used; since the work would be entirely outside of the recitation period, each was free to try the project or leave it alone.

There were 110 pupils enrolled in her classes at that time. At the end of six weeks, sixty-one notebooks came in, two students volunteered to talk in class about their explorations in poetic fields, and three students were writing poems. The collection of subjects was varied. Among the many subjects included were the following: "Children in Poetry," "An Old-Fashioned Garden," "Ships at Sea," "Around the Calendar."

The reading had been done independently; the selections were usually good, amazingly so in some cases; and sixty-one sophomores had read a goodly amount of verse. The teacher was delighted by the fact that twenty-two of the notebooks were done by boys—for she had said in suggesting the work that it always puzzled her to hear that boys could not read poetry, when most of the world's greatest poems had been produced by men.

59. A Puppet Show—The Merchant of Venice (A. M. Jacoby, University High School, Urbana)

A freshman class studying *The Merchant of Venice* undertook a puppet presentation of the play for a class project. One of the boys had a rather large wooden stage, with an actual stage opening about 19 x 22 inches, which he had built for puppet shows. He brought it to the classroom where all could work together in adapting it to the performance of a condensed version of Shakespeare's play. A coat of paint, curtains, a lighting system, three sets of scenery, and stage furniture were necessary. The girls brought dressed dolls, all of the same size, to serve as puppets. It was arranged to operate them by strings from above the stage. The stage was set on a level with the eyes and screened so that the actual operating of the puppets was not visible to the audience. Of course the instructor had to supervise and direct, subtly and tactfully, so that the more industrious pupils would not do too much and the indolent youngsters would make some contribution.

Another section of freshman English, also completing the study of the play, was invited to the puppet show. Readers, assigned to the various parts, sat in the front rows by the stage and provided the speeches. The audience derived much fun from seeing the curtain before the caskets drawn back with a wire hook when Portia spoke: "Go draw aside the curtain —;" it was also amusing to have to drop the curtains while Jessica made her descent from the balcony. The result was by no means finished and perfect, for the students had spent only one week's time on the project—and that outside of class. Nevertheless the general effect was all right. The freshmen had enjoyed their puppet show, and the fact that some of the least ambitious students re-read the play twice to get needed information for their parts in the project seemed to justify our efforts.

60. A Plan for the Novel Unit in a Senior English Class (A. M. Jacoby, University High School, Urbana)

The study of this unit on the novel occupied three weeks. The subject-

matter dealt with the main biographical data of eight famous English authors—namely, Scott, Austen, Thackeray, Dickens, Eliot, Stevenson, Kipling, and Hardy. Emphasis upon their personalities, characteristics, and works made the unit more a survey of the English novel than a study of its type and structure.

There was posted a long list of all available novels by these writers, to which were added a few easier ones, such as *Captains Courageous*, Masefield's *Martin Hyde*, Locke's *Beloved Vagabond*, and Barrie's *Little Minister*, to take care of the duller pupils who had not read as much as the average and were not prepared to enjoy Thackeray or Hardy. Each student was to select two books for his own reading. This reading was given book-report credit, and extra credit was given for additional reading. Each student consulted with the instructor about his selection, for the instructor knew her students well enough to direct their choice and to give them a general idea of the contents of each book.

A rather formal written report was made on one of the two books, with attention directed toward characterization, author's personality and style, and communication to the rest of the class of what was good about the book. Free, frank, informal opinions were solicited.

The treatment of the second novel was quite different. Each student chose an interesting dramatic scene from his book, made his plans for a simple dramatization of it, had his plans approved by the instructor, selected a cast from the class, and directed and staged his selection. In this way every one became familiar with many books on the list, as well as with his own. One class period was devoted to informal discussion and preparation, the students working in groups, selecting casts, and making other preparations. All other work and rehearsing was done during study periods or outside school hours. Two hours were given over to the actual presentations on the stage in the gymnasium with the rest of the class as audience. Some students had written scenarios using properties and costumes; some memorized their parts; others read them; some used only pantomime. Of course, there were dangers to be guarded against; the star actor of the class, being an obliging soul, was almost overworked, and the inevitable lazy ones needed prodding, lest their scenes be too brief; but the advantages gained far outweighed any difficulties. On the whole, the unit stimulated interest in the older and greater novels and instilled in the pupils an appreciation of their literary style.

Oral Composition

61. A Magazine Club (Louise Taylor, Danville High School)

In order to make oral composition work more alive and to stimulate interest in the reading of good magazines, the members of a sophomore English class organized themselves into a club which was to meet every two weeks for the purpose of promoting more extensive magazine reading. One semester the name, Outside Interest Club, was chosen and another time that of Magazine Club.

At the beginning of the first semester the students were given a general topic upon which to read for each meeting. The topics were of this sort: "Nature," "Travel," "Interesting People," "Interesting Events," "Modern

Invention," and "Art and Music." This limitation caused meetings to have a theme around which the talks centered. One class period the librarian brought to the class a number of magazines and talked to the students upon the type of reading to be found in each, calling attention to any outstanding features. The students took notes on the librarian's suggestions of certain magazines best for each type of subject and used these for reference during the semester.

Thinking that this limitation of subjects prevented the use of much excellent reading material, the instructor altered the plan the second semester. The reading was to be done on any subject found in approved current magazines. This time familiarity with magazines was promoted by a "browsing" period, in which a good collection of magazines was brought to the class and circulated among the students, each student trying to look through at least five or six.

For the biweekly meeting of the club, each student was to prepare a three-minute talk based upon some magazine article of interest to him. A chairman, chosen by the teacher, presided at the meeting, presented the speakers, and led any discussion resulting from the talk. Each student was asked to report the name of his talk one day in advance of the club meeting. This gave the chairman an opportunity to arrange the order of talks and also to give the subject of the talk as the speaker was introduced. Some very clever plans of presentation were worked out by various chairmen.

Correct parliamentary form was insisted upon. The student addressed and was recognized by his chairman before coming to the front to speak. All comments and questions were handled through the chairman.

Soon after the first trial of this plan a new interest in oral composition was noticeable, for to many a new field of reading had been opened. Better talks naturally resulted when the students found something really appealing to them about which they could tell the class. Emphasis was placed at all times upon reading for enjoyment and upon bringing to the class only that about which the student was himself enthusiastic.

Spelling

62. A Cumulative Word List for High-School Spelling (M. E. Boyer, Danville High School)

Have the students keep lists of words they have misspelled on their papers; test them on these words several times during the semester.

63. A Time Test for Spelling Drill (M. E. Boyer, Danville High School)

To stimulate concentration, tell the students that you want to see whether they can learn to spell ten words in three minutes. Make necessary explanations before you uncover the list. Follow with a written test, which is to be immediately checked. Repeat the process, allowing two minutes for study, and the next time only one minute. Mention the failure of some members to concentrate, and let these individuals know the things you discover about their study habits during these brief periods. Carry on these drills in the spirit of fun. The students enjoy the game

and derive much benefit from it. Occasional reviews will prove that the spelling of these words has been remembered as well as when the words have been studied for longer periods outside the class hour.

DEVICES FOR TEACHING FOREIGN LANGUAGES

Latin

64. A Search for Latin Derivatives (Alice Roberts, Glenbard Township High School, Glen Ellyn)

A device for associating Latin words with English, for showing the importance of the study of Latin, and for teaching Latin roots was carried out as follows:

Each student was given a stem, such as *fac.*, *cap.*, *ven.*, and so forth, and asked to represent by a picture all the words he could find derived from that stem. The teacher gave the class ideas for procedure by telling them that they could represent the stem by a tree and the words by branches and leaves. The result was a surprisingly large number of words. The students were urged to use original ideas for their representation.

65. English Illustrations of Latin Principles (Grace Parker, Bloomington High School)

In beginning the study of a language a helpful plan is to use illustrative English sentences for making clear fundamental principles of grammar and, incidentally, for refreshing the minds of those who do not know one part of speech from another, or the subject from the object, the passive voice from the past tense, and so forth. A certain number of English sentences are assigned to be composed by each student to illustrate the subject, possessive, direct object, and so forth. On the day following the assignment the sentences are written on the board. Word relations are indicated by underlining words with chalk of different colors; e.g., the subject is underlined with green, the verb with red, and so on.

66. An Introduction to "Qui, Quae, Quod" (M. J. Boysen, University High School, Urbana)

One teacher of Latin introduces the relative pronoun by reading the story, "Juno's Peacock." She tells the class that their part of the story-telling is to copy on their papers everything that she places on the blackboard as she reads. The story is told in English, and each relative pronoun—who, whom, whose, with whom, and so forth—is placed on the board with its Latin translation and case. When the story is finished, the students have a complete declension of the pronoun and have each form associated with its meaning, case, and use.

67. Original Latin Sentences for Translation (Grace Parker, Bloomington High School)

At times students are asked to make up Latin sentences illustrating new rules and to call on other students to translate these sentences. If both the illustrative sentence and the translation are correct, the student who composed the sentence and the one who translated it get a credit score,

but if either makes a mistake that is corrected by someone else, a point is deducted from his score.

68. **Identification Cards for Roman Characters** (M. J. Boysen, University High School, Urbana)

Flash cards bearing the names of characters in *Caesar*, *Cicero*, or *Virgil*, depending upon the class in which they are to be used, are displayed one at a time. The student called upon has to describe the character in order to obtain possession of the card. The winner of the contest is the one who acquires the most cards. These cards may be distributed to members of the class instead. In this case each student is asked to describe for identification the character whose name is indicated on his card.

69. **Some Latin Crossword Puzzles** (Anice Seybold, Chandlerville High School)

¹ A	≡	≡	≡	² I
³ M	⁴ E	≡	⁵ E	S
≡	⁶ N	O	S	≡
⁷ E	T	≡	⁸ T	⁸ E
X	≡	≡	≡	T

Horizontal

3. First person singular accusative pronoun
5. You are
6. We
7. And
8. You (acc.)

Vertical

1. First person singular future ending for third and fourth conjugations
2. He (nom.)
4. Third person plural future ending for third and fourth conjugations
5. He is
7. Preposition—out from
8. And

¹ P	O	N	² I	³ S
⁴ A	≡	≡	⁵ E	I
R	≡	≡	≡	G
A	≡	≡	⁶ I	N
⁷ R	E	S	≡	U
⁸ E	T	I	A	M

Horizontal

1. You are placing
4. From (preposition)
5. Dative singular demonstrative pronoun
6. Preposition—in or into
7. Thing
8. Also

Vertical

1. To prepare
2. Abbreviation—that is
3. Sign

≡	≡	¹ M	≡	² D	≡	≡
³ I	N	I	M	I	C	A
≡	≡	T	≡	C	≡	≡
≡	⁴ E	T	≡	⁵ E	T	≡
≡	≡	E	≡	M	≡	≡
⁶ E	≡	N	≡	U	≡	⁷ E
⁸ M	A	T	U	R	A	S

Horizontal

3. Unfriendly (feminine, nominative singular)
 4. And
 5. And
 8. You are hastening

Vertical

1. They will send
 2. We shall be spoken
 6. An exclamation
 7. You are

70. A Remedial Chart for the Pupil Who Doesn't Understand Declension of Latin Nouns (M. J. Boysen, University High School, Urbana)

Case	Feminine	Masculine	Neuter
Singular			
Nominative.....			
Genitive.....			
Dative.....			
Accusative.....			
Ablative.....			
Plural			
Nominative.....			
Genitive.....			
Dative.....			
Accusative.....			
Ablative.....			

The chart above should be blocked out on a piece of cardboard about 8 inches wide by 11 inches long. The endings for the two declensions are then printed on cards just large enough to fit into the blank spaces. The retarded student, in conference with the teacher, is told to arrange the endings in their proper places on the chart. This enables the teacher to locate the points of difficulty quickly, as well as to provide drill for the pupil.

71. A Dramatized Review of Cicero's First Oration

In order to motivate a meaningful and unified review of Cicero's first oration, a teacher of Latin assigned one or two chapters to each student, with the request that he be able to translate those passages from the class texts the next day, impersonating Cicero as he did so. The class was arranged like a Roman senate, with Catiline slinking into a seat at one corner. Directions were given for Catiline's entrance and exit, and a few other minor details were considered. Makeshift costumes were improvised for the leading characters. The results, though very crude from the standpoint of dramatics, were excellent for the review. The translations were nearly all forceful and intelligent, and the whole oration was presented as a connected, meaningful discourse.

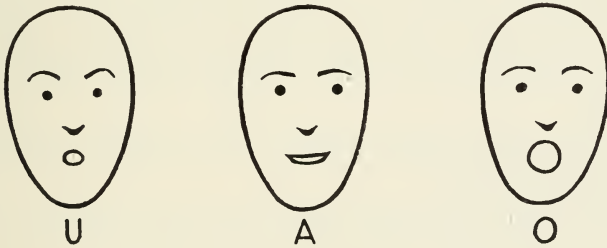
French

72. An Assignment in Conversational French (Dorothy Brooks, Deerfield-Shields High School, Highland Park)

In a French reading class certain students were designated to be responsible for questioning the class in French on each page of the advance lesson. The students who were to do the questioning were to take charge of the class during the particular part of the assignment over which they were to question the others. The "extra" feature of the assignment required each student to be prepared to act out some certain thing, after which the members of the class were to tell in French what he had done.

73. Pronunciation Aids to Beginners in French (Claire Bocquin, Deerfield-Shields High School, Highland Park)

The students in one teacher's French classes like to draw pictures (of the teacher, usually) to show the position of the mouth for pronunciation. For example:



Whistling is also a valuable aid in teaching the pronunciation of those sounds for which the lips must be rounded. The class actually whistles, holds the mouth position, and tries to say *e* or *a*.

Accurate pronunciation can be motivated by allowing a student to give the dictation to the class. If the dictation contains some words unfamiliar to the class, the importance of proper pronunciation is keenly felt, since the class is writing "by ear."

74. Dramatization of French Play Scenes (Alice Roberts, Glenbard Township High School, Glen Ellyn)

Extra credit is given to those advanced French students who dramatize in French scenes of plays read in class. This dramatization gives practice in forming sentences for conversation.

75. Concrete Illustrations for French Vocabulary Lessons (Dorothy Brooks, Deerfield-Shields High School, Highland Park)

A class in beginning French sketched gardens, with labeled drawings to represent garden vocabulary, and the interior of a grocery store, with articles labeled in French to illustrate food vocabulary, and so forth.

German

76. Reading German Poems Aloud in Unison (E. I. Kubitz, Danville High School)

The students in one teacher's classes, after memorizing a poem, read it in concert with the sincerest interpretation they are capable of giving. This concert reading is usually engaged in toward the end of the period. For example, with quiet voices and awed intonation the students read in concert, once, twice, perhaps three times, "Über allen Gipfeln ist Ruh." After the reading there is deep silence. The bell sounds. The spell is broken, but the pupils have lived the beauty of a language and thought! They have felt its power! They love it!

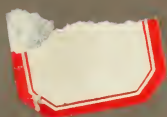
General

77. An Auction of Flash Cards (M. J. Boysen, University High School, Urbana)

This device is for vocabulary drill in foreign-language classes. Words, phrases, and short sentences are printed in large letters on cards. The teacher displays the cards one at a time and "sells" them to the first pupil called upon who gives a correct translation. The one who is able to "buy" the largest number of cards then auctions his group of cards to the rest of the class. Thus the sale continues until the teacher considers the day's drill sufficient.

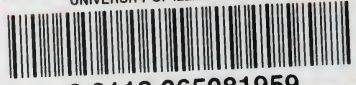
78. A Project in Vocabulary Study (M. J. Boysen, University High School, Urbana)

A teacher of foreign languages cut pictures from magazines, numbered them, and displayed them around the room. At the end of a certain time each picture was given to the pupil who handed in the longest list of articles found in it—the list, of course, being made out in the foreign language under study. The contest was continued by letting the winners sell their pictures to other members of the class for word lists.





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